Name: _____ Date: _____ Period: _____

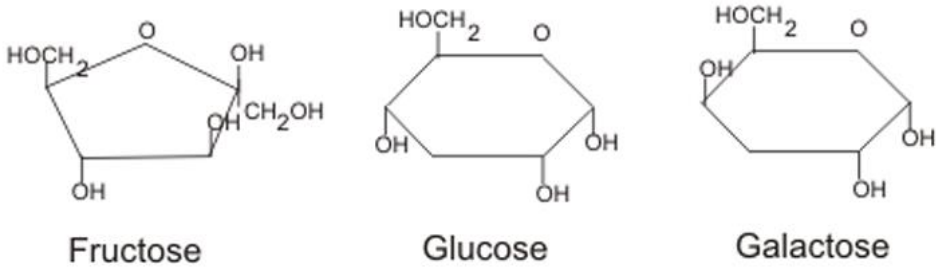
Identifying the Macromolecules Worksheet

Ms. OK, PreAP Biology, 2014-2015.

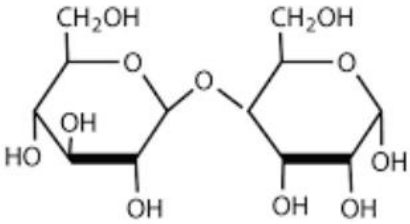
Tips for Identifying Pictures of Macromolecules:

Carbohydrates

- Pictures of carbohydrate monomers (monosaccharides) have one ring of carbon atoms (looks like a pentagon or hexagon) with oxygen atoms and hydrogen atoms branching off the ring. (Remember: the basic chemical formula for a carbohydrate is $C_1H_2O_1$)

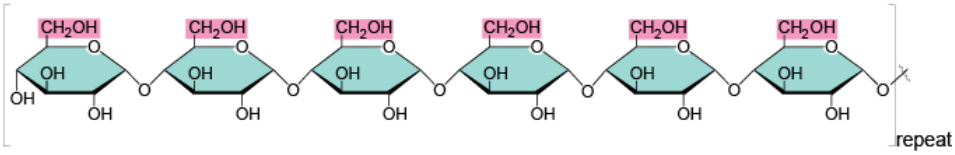


- Pictures of carbohydrate dimers (disaccharides) have two rings of carbon atoms joined together by bonds

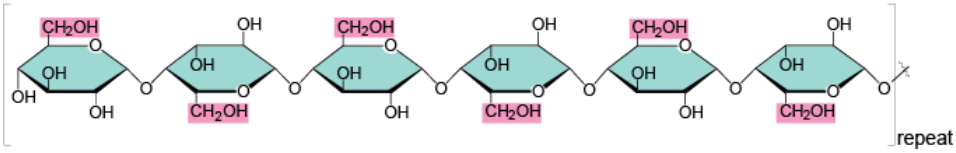


- Pictures of carbohydrate polymers (polysaccharides) have several rings of carbon atoms joined together by bonds.

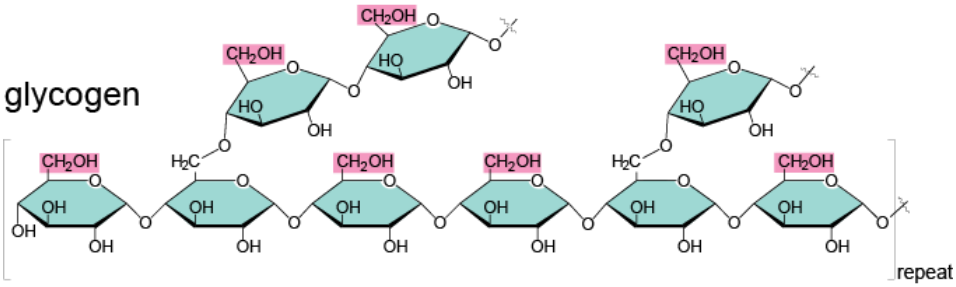
starch



cellulose

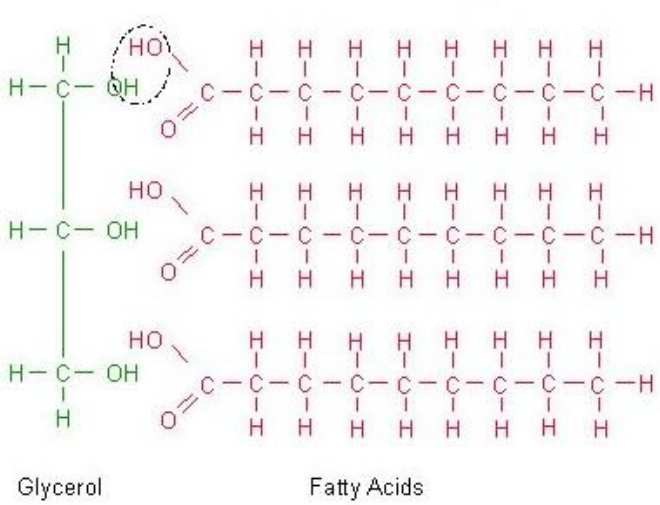


glycogen



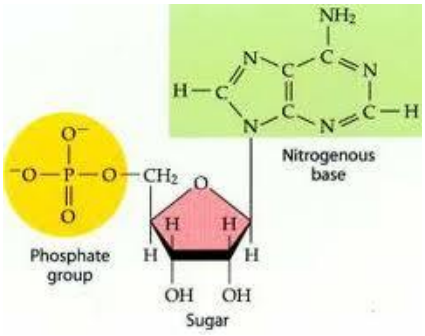
Lipids

- Pictures of lipid polymers (fats) have a glycerol molecule (three carbon atoms joined in a chain with oxygen and hydrogen atoms branching off) linked to one or more fatty acid molecules (long chains of carbon and hydrogen atoms)

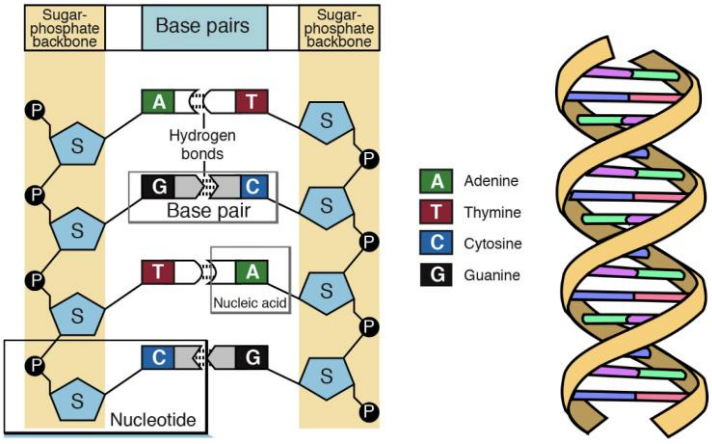


Nucleic Acids

- Pictures of nucleic acid monomers (nucleotides) have a phosphate group (with a phosphorus atom surrounded by four oxygen atoms, PO_4^{2-}), a 5-carbon sugar (looks like a pentagon), and a nitrogenous base (looks like one or two rings containing nitrogen atoms



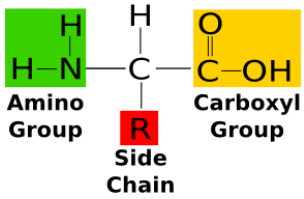
- Pictures of the nucleic acid polymer DNA have a double helix structure (a winding staircase) that is composed of two chains of nucleotides. When "untwisted" the DNA molecule looks like a ladder. The phosphate groups and 5-carbon sugars of each nucleotide are located in the sides of the ladder, and the nitrogen bases form the middle "rungs" of the ladder.



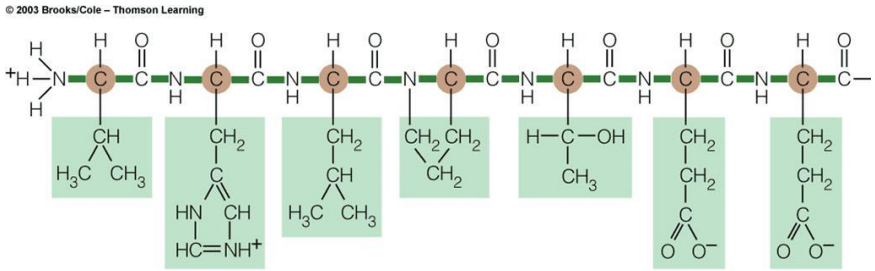
- Pictures of the nucleic acid polymer RNA show a single chain of nucleotides with the nitrogen bases "sticking out" from the chain.

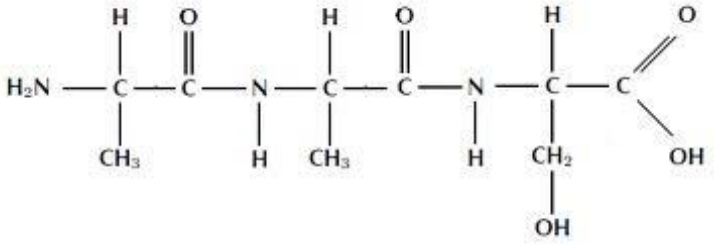
Proteins

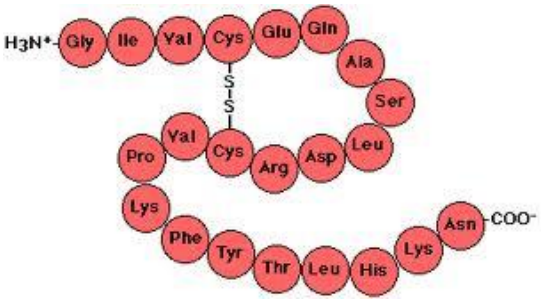
- Pictures of protein monomers (amino acids) have a central carbon atom bonded to four things: a single hydrogen atom, an amino group (contains nitrogen and hydrogen atoms), a carboxyl group (contains a carbon atom that is double-bonded to an oxygen atom), and an R group (changes for each of the 20 different amino acids)



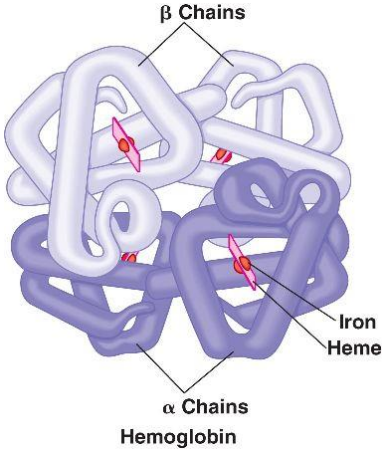
- Pictures of protein polymers (polypeptide) show a chain of amino acids, with the amino group of one amino acid bonded to the carboxyl group of the next amino acid in the chain.



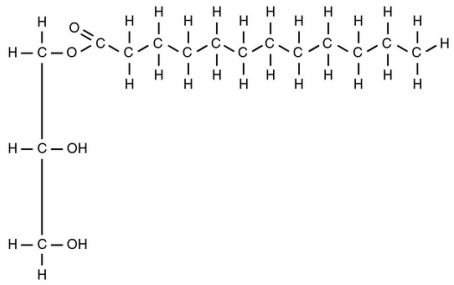
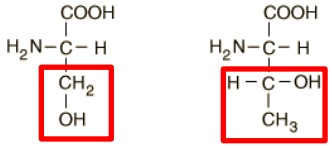
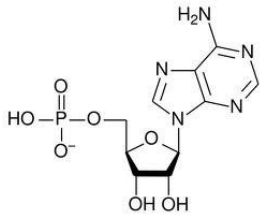


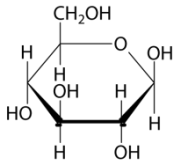
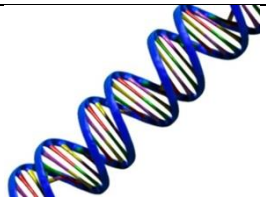
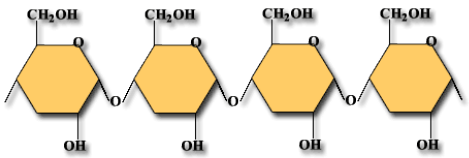


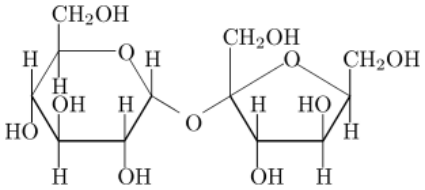
- Pictures of a “full protein” may show multiple polypeptide chains folded around one another.

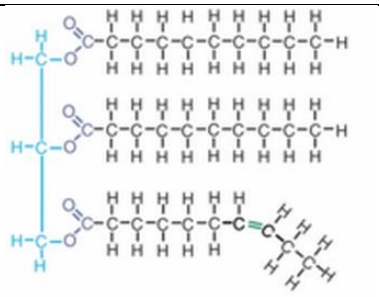


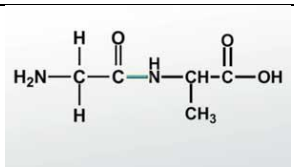
Directions: *Place a check mark in the column of each kind of macromolecule that has each characteristic. Some may need more than one check*

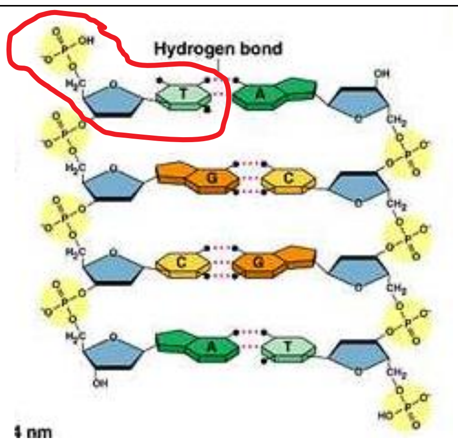
Characteristics	Carbohydrate	Lipid	Protein	Nucleic Acid
		X There is a glycerol (contains 3 C's and 3O's) bonded to a fatty acid (a long chain of C's with H's branching off)		
			X These are amino acids (the monomers for proteins), which have a central carbon atom bonded to four things: an amino group (NH_2), a carboxyl group (COOH), a single hydrogen atom, and an R group (the atoms that are in these R groups change from amino acid to amino acid… the R groups are shown in red boxes in the image to the left)	
				X This is a nucleotide (the monomer of nucleic acids), which is made of three components: a phosphate group (contains a "P" atom and may be represented with a circle on a diagram), a 5-carbon sugar

				(looks like a pentagon), and a nitrogen base (looks like one ring or two fused rings that contain “N” atoms)
	X This is a monosaccharide (the monomer of carbohydrates). A monosaccharide is typically shown as a pentagon or hexagon.			
Enzymes (molecules that speed up chemical reactions) are an example of this type of macromolecule			X	
Includes fats and oils		X Fats, oils, and waxes are examples of lipid polymers		
Polymers formed from amino acids			X	
				X This is a DNA molecule, which is an example of a nucleic acid polymer (along with RNA). We can tell that it’s DNA because it has a double helix structure (which looks like a spiral staircase).
Always contains carbon and hydrogen	X	X	X	X
	X This is a polysaccharide (the polymer of carbohydrates). A polysaccharide contains several monosaccharides (which look like pentagons or hexagons) linked in a chain.			
DNA and RNA are examples of this type of macromolecule				X

				DNA and RNA are examples of nucleic acid polymers.
Table sugar (sucrose) is an example of this type of macromolecule	X Table sugar is a disaccharide, which is made of two monosaccharides (the monomers of carbohydrates) linked together. Specifically, two monosaccharides called glucose and fructose are joined to make table sugar (sucrose).			
	X This is a disaccharide. Disaccharides contain two monosaccharides (which look like hexagons or pentagons) joined together. You don't need to know this, but the specific disaccharide shown is sucrose (glucose is on the left and fructose is on the right).			
Stores genetic information				X
Is a polymer	X All of the macromolecules have polymers.	X All of the macromolecules have polymers.	X All of the macromolecules have polymers.	X All of the macromolecules have polymers.
Controls cellular activities				X The information stored in DNA and RNA is used to direct processes that occur in cells.

		X This is a triglyceride (aka fat), which is one example of a lipid polymer. A triglyceride contains a glycerol (contains 3 C's and 3O's) bonded to three fatty acids (long chains of C's with H's branching off)		
The polymer of this macromolecule is called a polypeptide			X	
Is made of nucleotides				X Nucleotides are the monomer of nucleic acids.
Is an organic compound	X All four macromolecules contain carbon, which makes the organic compounds (aka organic molecules)	X All four macromolecules contain carbon, which makes the organic compounds (aka organic molecules)	X All four macromolecules contain carbon, which makes the organic compounds (aka organic molecules)	X All four macromolecules contain carbon, which makes the organic compounds (aka organic molecules)
Includes starches	X Starches are an example of a carbohydrate polymer.			
Made up of monomers	X All four macromolecules have building blocks called monomers.	X All four macromolecules have building blocks called monomers. (Note: Some people do not consider glycerol and fatty acids to be monomers of lipids, but Mrs. Krouse does!)	X All four macromolecules have building blocks called monomers.	X All four macromolecules have building blocks called monomers.
Is an organic compound	Already answered	Already answered	Already answered	Already answered

			X This is a dipeptide (two amino acids joined together). I can tell that it's a dipeptide because there are two amino groups (NH_2) and two carboxyl groups (COOH), which are found on amino acids. Note: the carboxyl group on the amino acid on the left side of the dipeptide lost an OH during dehydration synthesis to join the amino acids together. The amino group on the amino acid on the right lost an H during dehydration synthesis. Together, the OH from the left amino acid and the H from the right amino acid formed water (H_2O), which was released during dehydration synthesis. Note: When MORE than two amino acids are joined together, the chain of amino acids is called a polypeptide, which is the polymer for a protein.	
Formed by dehydration synthesis	X Polymers of all four macromolecules	X Polymers of all four macromolecules	X Polymers of all four macromolecules	X Polymers of all four macromolecules

	are formed through dehydration synthesis (joining monomers together to make polymers and losing water in the process). “Dehydration” means “losing water” and “synthesis” means “to build or make,” so dehydration synthesis involves building a polymer by losing water.	are formed through dehydration synthesis (joining monomers together to make polymers and losing water in the process). “Dehydration” means “losing water” and “synthesis” means “to build or make,” so dehydration synthesis involves building a polymer by losing water.	are formed through dehydration synthesis (joining monomers together to make polymers and losing water in the process). “Dehydration” means “losing water” and “synthesis” means “to build or make,” so dehydration synthesis involves building a polymer by losing water.	are formed through dehydration synthesis (joining monomers together to make polymers and losing water in the process). “Dehydration” means “losing water” and “synthesis” means “to build or make,” so dehydration synthesis involves building a polymer by losing water.
Its monomers usually end in “ose”	X Examples of monosaccharides (carbohydrate monomers) include glucose and fructose, whose names end in “ose.”			
				X This is a DNA molecule because it consists of two chains of nucleotides connected at the middle to create a ladder-like structure. (In real life, the ladder is actually twisted to create a double helix or spiral staircase structure.) A single nucleotide from the DNA molecule is circled in the image. It is recognizable because it is made of a

				phosphate group (contains a "P" atom and may be represented with a circle on a diagram), a 5-carbon sugar (looks like a pentagon), and a nitrogen base (looks like one ring or two fused rings that contain "N" atoms). In this diagram, the "N" atoms within the nitrogen bases are not labeled. Instead, the four different types of nitrogen bases are labeled with their first letter. The four different types of nitrogen bases are adenine (A), thymine (T), guanine (G), and cytosine (C).
Breaks apart by hydrolysis	X Polymers of all four macromolecules broken apart during hydrolysis (breaking apart polymers into monomers by adding water). "Hydro" means "water" and "lysis" means "to break," so hydrolysis involves breaking apart a polymer by adding water!	X Polymers of all four macromolecules broken apart during hydrolysis (breaking apart polymers into monomers by adding water). "Hydro" means "water" and "lysis" means "to break," so hydrolysis involves breaking apart a polymer by adding water!	X Polymers of all four macromolecules broken apart during hydrolysis (breaking apart polymers into monomers by adding water). "Hydro" means "water" and "lysis" means "to break," so hydrolysis involves breaking apart a polymer by adding water!	X Polymers of all four macromolecules broken apart during hydrolysis (breaking apart polymers into monomers by adding water). "Hydro" means "water" and "lysis" means "to break," so hydrolysis involves breaking apart a polymer by adding water!
Important for defense, structure, storage, and transport			X Proteins have many possible functions, and	

			these are examples of protein functions.	